What is claimed is:

1. A laser formed by an optical resonator comprising:

a) an electrically pumped semiconductor gain medium comprising a single-mode optical waveguide having first and second endfaces, where said first endface is an output coupler of said optical resonator, from which a beam with total power P_a is emitted from said second endface,

b) a lens which receives said emitted beam and transmits it to,

c) an acousto-optic device which receives said transmitted beam, wherein said received beam is distorted and attenuated, but not frequency shifted, in the course of transmission through the acousto-optic device, and wherein the extent of the distortion and attenuation is dependent on the received beam wavelength and the RF frequency applied to the acousto-optic device, and

d) a return mirror which reflects said non frequency-shifted beam back through said acousto-optic device and said lens,

whereby said reflected beam impinges on said second endface with a total power P_b, with a lesser optical power P_0 being launched into the gain medium waveguide,

such that P_0/P_a has a maximum value at a wavelength λ_0 where the total loss due to mode mismatching and attenuation in the external cavity is minimized, where λ_0 is selected by said acousto-optic device in response to the RF frequency applied to said acousto-optic device,

and wherein λ_0 is the wavelength of laser emission from said first endface.

2. The laser of claim 1 wherein said optical resonator also contains a grid fixing etalon.

3. The laser of claim 1 wherein discrete tunability is achieved by utilizing a

parasitic etalon positioned within said optical resonator.

4. The laser of claim 1 where discrete tunability is achieved by adjusting the round trip optical path length of said optical resonator.

5. A laser formed by an optical resonator comprising:

a) a pumped gain medium comprising a single-mode optical waveguide having first and second endfaces, where said first endface is an output coupler of the optical resonator, from which a beam with total power P_a is emitted from said second endface,

b) coupling optics which receive the beam emitted from said second endface and transmit it to,

c) a spectrally dependent spatial filtering (SDSF) tuning element which receives said transmitted beam, and which allows said received beam to exit from the tuning element as a beam that is attenuated and distorted without a frequency shift, wherein the extent of the attenuation and distortion depends on said received beam wavelength, and wherein said SDSF tuning element includes control means to alter the wavelength dependence of the beam distortion and attenuation,

d) a return mirror which reflects said distorted and attenuated beam back through said tuning element and said coupling optics,

whereby said reflected beam impinges on said second endface with a total power P_b, with a lesser power P_0 being launched into the gain medium waveguide,

such that P_0/P_a has a maximum value at a wavelength λ_0 where the total loss due to mode mismatching and attenuation in the external cavity is minimized, where λ_0 is selected by said tuning element,

and wherein λ_0 is the laser emission wavelength from said first endface.

6. The laser of claim 5, wherein said SDSF tuning element is a volume

hologram, aligned such that the propagation direction of laser beam within said optical resonator is nominally unchanged in transmission through said hologram.

7. The laser of claim 5 wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

8. The laser of claim 7 where the three wave mixing interaction is an acousto-optic interaction.

9. The laser of claim 5 wherein said optical resonator also contains a grid fixing etalon.

10. The laser of claim 5 wherein discrete tunability is achieved by utilizing a parasitic etalon positioned within said optical resonator.

11. The laser of claim 5 where discrete tunability is achieved by adjusting the roundtrip optical path length of said optical resonator.

12. A laser formed by an optical resonator comprising:

a) a pumped gain medium comprising a single-mode optical waveguide,

b) a spectrally dependent spatial filtering (SDSF) tuning element, which allows said incident beam to exit from the tuning element as a beam that is attenuated and distorted without a frequency shift, wherein the extent of the attenuation and distortion depends on said incident beam wavelength, and wherein said SDSF tuning element includes control means to alter the wavelength dependence of the beam distortion and attenuation,

such that the total round trip loss attains a minimum value at a wavelength λ_0 selected by said tuning element,

whereby λ_0 is the laser emission wavelength.

13. The laser of claim 12, wherein said SDSF tuning element is a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally unchanged in transmission through said hologram.

14. The laser of claim 12 wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

15. The laser of claim 14 where the three wave mixing interaction is an acousto-optic interaction.

16. The laser of claim 12 wherein said optical resonator also contains a grid fixing etalon.

17. The laser of claim 12 wherein discrete tunability is achieved by utilizing a parasitic etalon positioned within said optical resonator.

18. The laser of claim 12 where discrete tunability is achieved by adjusting the round trip optical path length of said optical resonator.

19. A laser formed by an optical resonator comprising:

a) a pumped gain medium,

b) a spectrally dependent spatial filtering (SDSF) tuning element, which allows said incident beam to exit from the tuning element as a beam that is attenuated and distorted without a frequency shift, wherein the extent of the attenuation and distortion depends on said incident beam wavelength, and wherein said SDSF tuning element includes control means to alter the wavelength dependence of the beam distortion and attenuation,

c) a spatial filter,

such that the total round trip loss attains a minimum value at a wavelength λ_0 selected

by said tuning element,

whereby λ_0 is the laser emission wavelength.

20. The laser of claim 19, wherein said SDSF tuning element is a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally unchanged in transmission through said hologram.

21. The laser of claim 19 wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

22. The laser of claim 21 where the three wave mixing interaction is an acousto-optic interaction.

23. The laser of claim 19 wherein said optical resonator also contains a grid fixing etalon.

24. The laser of claim 19 wherein discrete tunability is achieved by utilizing a parasitic etalon positioned within said optical resonator.

25. The laser of claim 19 where discrete tunability is achieved by setting the round trip optical path length of said optical resonator.

26. A laser formed by an optical resonator comprising:

a) a pumped gain medium comprising a single-mode optical waveguide,

b) a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally unchanged in transmission through said hologram,

such that the total round trip loss attains a minimum value at a wavelength λ_0 selected by said hologram,

whereby λ_0 is the laser emission wavelength.

27. A method for generating a tunable laser beam comprising the steps of:

a) pumping a gain medium positioned within an optical resonator,

b) passing the beam through a spectrally dependent spatial filtering (SDSF) tuning element within said optical resonator,

c) passing the beam through a spatial filter within said optical resonator,

d) distorting and attenuating the beam passing through said SDSF tuning element in accordance with a beam distortion and attenuation control signal, such that the total round trip loss within said optical resonator is minimized at a wavelength λ_0,

e) tuning the wavelength of said laser beam by selecting λ_0 by said SDSF tuning element in response to the beam distortion and attenuation control signal,

f) emitting laser radiation having a wavelength λ_0 from an output coupler within said optical resonator.

28. The method for generating a tunable laser beam set forth in claim 27 wherein said SDSF tuning element is a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally unchanged in transmission through said hologram.

29. The method for generating a tunable laser beam set forth in claim 27 wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

30. The method for generating a tunable laser beam set forth in claim 29 where the three wave mixing interaction is an acousto-optic interaction.

31. The method for generating a tunable laser beam set forth in claim 27 comprising the further steps of:

g) inserting a secondary output coupler into said optical resonator such that a fraction of the circulating laser beam within said optical resonator is emitted from said secondary output coupler,

h) dividing said emitted beam into a first sub-beam in a first optical path, and a second sub-beam in a second optical path,

i) filtering said second sub-beam with a linear transmission filter placed in said second optical path to produce a filtered second sub-beam,

j) determining relative beam intensities of said first sub-beam in said first optical path and said second filtered sub-beam in said second optical path in order to measure the laser emission wavelength,

32. The method for generating a tunable laser beam set forth in claim 31 wherein said SDSF tuning element is a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally unchanged in transmission through said hologram.

33. The method for generating a tunable laser beam set forth in claim 31 wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

34. The method for generating a tunable laser beam set forth in claim 33 where the three wave mixing interaction is an acousto-optic interaction.

35. The method for generating a tunable laser beam set forth in claim 27 comprising the further steps of:

g) inserting a secondary output coupler into said optical resonator such that a fraction of the circulating laser beam within said optical resonator is emitted as a first beam from said secondary output coupler, and such that a fraction of the diffracted beam generated within said SDSF tuning element is emitted as a second beam from said secondary output coupler,

h) determining relative beam intensities of said first beam and said second beam in order to measure the difference between the laser emission wavelength and the center wavelength of the zeroth order spectral notch of said SDSF tuning element.

36. The method for generating a tunable laser beam set forth in claim 35 wherein said SDSF tuning element is a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally unchanged in transmission through said hologram.

37. The method for generating a tunable laser beam set forth in claim 35 wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

38. The method for generating a tunable laser beam set forth in claim 37 where the three wave mixing interaction is an acousto-optic interaction.

39. The method for generating a tunable laser beam set forth in claim 27 comprising the further steps of:

g) inserting a grid fixing etalon into said optical resonator in order to provide discrete tunability,

h) inserting a secondary output coupler into said optical resonator such that a fraction of the circulating laser beam within said optical resonator is emitted as a first beam from said secondary output coupler, and such that a fraction of the beam generated

within said optical resonator by reflection of the circulating laser beam from a surface of said grid fixing etalon is emitted as a second beam from said secondary output coupler,

i) determining relative beam intensities of said first beam and said second beam in order to measure the difference between the laser emission wavelength and the wavelength of the transmission peak of said grid fixing etalon.

40. The method for generating a tunable laser beam set forth in claim 39 wherein said SDSF tuning element is a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally unchanged in transmission through said hologram.

41. The method for generating a tunable laser beam set forth in claim 39 wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

42. The method for generating a tunable laser beam set forth in claim 41 where the three wave mixing interaction is an acousto-optic interaction.

43. A method for generating a tunable laser beam comprising the steps of:

a) pumping a gain medium positioned within an optical resonator, said gain medium comprising a single-mode optical waveguide,

b) passing the beam through a spectrally dependent spatial filtering (SDSF) tuning element within said optical resonator,

c) distorting and attenuating the beam passing through said SDSF tuning element in accordance with a beam distortion and attenuation control signal, such that the total round trip loss within said optical resonator is minimized at a wavelength λ_0,

d) tuning the wavelength of said laser beam by selecting λ_0 by said SDSF tuning element in response to the beam distortion and attenuation control signal,

e) emitting laser radiation having a wavelength λ_0 from an output coupler within said optical resonator.

44. The method for generating a tunable laser beam set forth in claim 43 wherein said SDSF tuning element is a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally unchanged in transmission through said hologram.

45. The method for generating a tunable laser beam set forth in claim 43 wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

46. The method for generating a tunable laser beam set forth in claim 45 where the three wave mixing interaction is an acousto-optic interaction.

47. The method for generating a tunable laser beam set forth in claim 43 comprising the further steps of:

f) inserting a secondary output coupler into said optical resonator such that a fraction of the circulating laser beam within said optical resonator is emitted from said secondary output coupler,

g) dividing said emitted beam into a first sub-beam in a first optical path, and a second sub-beam in a second optical path,

h) filtering said second sub-beam with a linear transmission filter placed in said second optical path to produce a filtered second sub-beam,

i) determining relative beam intensities of said first sub-beam in said first optical path

and said second filtered sub-beam in said second optical path in order to measure the laser emission wavelength,

48. The method for generating a tunable laser beam set forth in claim 47 wherein said SDSF tuning element is a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally unchanged in transmission through said hologram.

49. The method for generating a tunable laser beam set forth in claim 47 wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

50. The method for generating a tunable laser beam set forth in claim 49 where the three wave mixing interaction is an acousto-optic interaction.

51. The method for generating a tunable laser beam set forth in claim 43 comprising the further steps of:

f) inserting a secondary output coupler into said optical resonator such that a fraction of the circulating laser beam within said optical resonator is emitted as a first beam from said secondary output coupler, and such that a fraction of the diffracted beam generated within said SDSF tuning element is emitted as a second beam from said secondary output coupler,

g) determining relative beam intensities of said first beam and said second beam in order to measure the difference between the laser emission wavelength and the center wavelength of the zeroth order spectral notch of said SDSF tuning element.

52. The method for generating a tunable laser beam set forth in claim 51 wherein said SDSF tuning element is a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally

unchanged in transmission through said hologram.

53. The method for generating a tunable laser beam set forth in claim 51 wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

54. The method for generating a tunable laser beam set forth in claim 53 where the three wave mixing interaction is an acousto-optic interaction.

55. The method for generating a tunable laser beam set forth in claim 43 comprising the further steps of:

f) inserting a grid fixing etalon into said optical resonator in order to provide discrete tunability,

g) inserting a secondary output coupler into said optical resonator such that a fraction of the circulating laser beam within said optical resonator is emitted as a first beam from said secondary output coupler, and such that a fraction of the beam generated within said optical resonator by reflection of the circulating laser beam from a surface of said grid fixing etalon is emitted as a second beam from said secondary output coupler,

h) determining relative beam intensities of said first beam and said second beam in order to measure the difference between the laser emission wavelength and the wavelength of the transmission peak of said grid fixing etalon.

56. The method for generating a tunable laser beam set forth in claim 55 wherein said SDSF tuning element is a volume hologram, aligned such that the propagation direction of the laser beam within said optical resonator is nominally unchanged in transmission through said hologram.

57. The method for generating a tunable laser beam set forth in claim 55

wherein three wave mixing occurs in said SDSF tuning element, and said SDSF tuning element is aligned such that no frequency shift is incurred in transmission through said element.

58. The method for generating a tunable laser beam set forth in claim 57 where the three wave mixing interaction is an acousto-optic interaction.